

among the local investigators in the district to the south of Vienna, which the author delights in calling that "*stückchen Erdrinde*," the book must at once take rank as a storehouse of actual facts never to be over appreciated.

The value of the memoir is much enhanced by the long bibliographical list with which Dr. Karrer opens the work, and which is brought up to date in the appendix. This list contains the titles of 566 books and papers relating to the region traversed by the *Aqueduct*, and arranged, as all such lists should be, in chronological order. The first paper cited is one by Wolfgang Anemarinus, on the Baden springs, and dates as far back as 1511.

From what we have said it will be seen that no labour has been spared to render this report as perfect as it could be made. One serious omission, however, must be called attention to. There is no index. The late Sir Roderick Murchison was wont to deplore that many of the details contained in his "big books" remained unknown and buried within them. But books like the "Silurian System" are certain to be consulted, index or no index. To publish a work so local in character, albeit so complete in its execution as the one under review, as Dr. Karrer has done, without a key to the endless facts it contains, is deliberately to court non-recognition.

Before concluding we would note the excellent geological map of Vienna and its immediate neighbourhood, by Th. Fuchs. This map was first issued in 1874, and is conveniently reproduced in the present memoir.

G. A. LEBOUR

A CENTURY OF DISCOVERY

The Discoveries of Prince Henry the Navigator, and their Results; being the Narrative of the Discovery by Sea, within One Century, of more than Half the World. By Richard Henry Major, F.S.A. Portraits, Maps, &c. (London: Sampson Low and Co., 1877.)

Geschichte des Zeitalters der Entdeckungen. Von Oscar Peschel. Zweite Auflage. (Stuttgart: J. G. Cotta, 1877.)

THESE two works practically refer to the same period, which nearly coincides with the fifteenth century, and deal mainly with the same events. Mr. Major's work centres round Prince Henry as the initiator of the remarkable series of discoveries which were made during the century referred to, while that of the late Oscar Peschel deals with these events as forming a remarkable era in geographical discovery, and is considerably more detailed than the work of Mr. Major. Both works are virtually second editions. In its present form Mr. Major's is somewhat more popular than when first published, the discussion of certain points interesting only to the student having been omitted; Peschel's work, first published about twenty years ago, is practically unaltered. Both works are valuable contributions to the history of one of the most eventful centuries of our era; Mr. Major's is a worthy record of the life and work of a noble-minded prince, while Peschel's is a standard authority on the geographical work of the fifteenth century.

Prince Henry, aptly styled "the Navigator," was the fifth child of King João I., of Portugal, and his Queen Philippa, daughter of "old John of Gaunt, time-honoured

Lancaster," and was born in 1394. He was carefully trained by his English mother, and after having distinguished himself at Ceuta, took up his abode on the promontory of Sagres in Algarve, of which kingdom he was made governor in perpetuity. It was from here that during the rest of his life he initiated and directed those discoveries with which his name will be ever associated; to Prince Henry, there is no doubt, the rapid progress of geographical exploration during the fifteenth and sixteenth centuries is mainly due. But not only in this way did he encourage the advance of knowledge; by providing professorships, and in other ways, he did much to foster the progress of science such as it was in his time; his own favourite subjects of study were astronomy and mathematics.

It is with Africa that Prince Henry's name is chiefly associated. Before commencing his great work of exploration he took every means in his power of ascertaining all that was known about Africa, though that was not much. Cape Blanco he knew, though vaguely, but all the coast south of that was practically a blank. The interior was known much farther southwards, and not a few details of Timbuctoo had reached Europe by the beginning of the fourteenth century. It does not seem to be known whether Prince Henry had the means of making himself acquainted with the work done by the Phœnicians and Carthaginians; the narrative of Hanno's famous coasting voyage would have been a treasure to him, but the likelihood is that he was totally ignorant of the work accomplished by these pre-Christian explorers. Nor is it likely that he had heard of the Norse discovery of America, though he may have heard of the famous voyages of the brothers Zeni; if he had it does not seem to have suggested to him the existence of a great continent far beyond the horizon which bounded his outlook from Sagres. Prince Henry set about the work of African exploration with intelligence, his clear object apparently having been to trace the African coast to its southernmost limit, and even discover by rounding it a practical sea-route to India.

"Very few details are left us," Mr. Major writes, "of the astronomical instruments used in the time of Prince Henry. The altitude of a star was taken by the astrolabe and the quadrant by means of an alidade, or ruled index, having two holes pierced in its extremities, through which the ray passed. The quadrant hung vertically from a ring which was held in the hand. We do not know how these instruments were graduated, but it is to be presumed very roughly. The astrolabe, the compass, timepieces, and charts, were employed by sailors in the Mediterranean at the beginning of the fifteenth century. It is quite certain that the needle was used at sea before Prince Henry's time, for he himself speaks of it when urging on one of his navigators to the rounding of Cape Bojader." During the lifetime of Prince Henry the African voyagers stuck closely to the coast, except when by accident they were driven from it.

The Prince's enthusiasm and generosity drew to him most of the adventurous spirits of his time, and thus it was that after his settlement on Sagres scarcely a year passed that he did not send out one or more expeditions to carry on the great work which he had set himself to accomplish. The first fruit of Prince Henry's enterprise

was the finding of the islands of Porto Santo and Madeira, in 1418-20, by two squires of his own household, who were driven thither, by a storm off Cape St. Vincent. Mr. Major has, however, proved satisfactorily, we think, that the Madeira group were discovered about the end of the previous century by an adventurous Englishman named Robert Machin.

For long had Cape Bojader proved an obstacle which the Portuguese sailors sent out by the Prince attempted in vain to pass; Cap Nun had been passed, but the increasing violence of the waves that broke upon the dangerous northern bank of Cape Bojader proved too much for the cockle-shells in which Prince Henry's explorers were hardly enough to risk their lives. It was only in 1434 that Gil Eannes, a native of Lagos, managed to pass this fancied terrible obstacle to progress, by putting well out to sea. Next year another fifty leagues were added to the stretch of coast discovered, and thus year after year, league upon league was added, and specimens of the people and products brought home, the former to be Christianised and sent back to convert their brethren. By the time of Prince Henry's death in 1460, the west coast of Africa had been explored under his auspices as far south as the Rio Grande, the Canaries, Cape Verde Islands, and Madeira discovered or rediscovered, and a large amount of substantial information obtained about the people, the products, and the country far into the interior of Northern Africa.

Mr. Major justly designates Prince Henry the originator of continuous modern discovery, for Portuguese enterprise in this direction was not stopped by his death. It was not, however, till 1471 that the equinoctial line was crossed for the first time within the memory of man, probably by an explorer named Lopo Gonsalvez. The equator was not much surpassed till Diego Cam set out in 1484 and discovered the mouth of the Congo; the celebrated Martin Behaim, the inventor of the application of the astrolabe to navigation, was with Diego Cam in this eventful voyage. In his next voyage Diego got as far south as Cape Cross in 22° south latitude, where the cross he planted is still to be seen in almost complete preservation. In 1486 Bartholomew Diaz was sent out by King João, of Portugal, to carry out the discovery of the African coast, and, without knowing it, passed the southernmost part of Africa and came to anchor in what is now known as Flesh Bay, near Guaritz river, to the east of Cape Agulhas. He turned back after reaching the mouth of the Great Fish river, and it was on this return voyage that he discovered what he called Cape Tormentoso, but which King João on his return, "foreseeing the realisation of the long-coveted passage to India," named Cape of Good Hope. It was not till ten years after this that a practical test was made of the utility of this passage to India. Vasco da Gama left Lisbon with four vessels, the largest not exceeding 120 tons, in July, 1497, and coasted south the west coast, and north the east coast of Africa, as far as Melinda, to the north of Mombassa, which was reached in April of the following year. On April 20, 1498, he sailed for Calicut, before which he anchored on May 20, thus discovering the famous "Cape route" to India.

Such are a few of the results which are directly or indirectly due to the far-seeing enterprise and noble-mindedness of Prince Henry the navigator. But these are

not all. But for his initiative in the beginning of the century, it is doubtful if America would have been discovered at the end of it, and had Prince Henry been alive when Columbus began his memorable agitation, that greatest of explorers would doubtless have been saved much humiliation and misery. Magellan's circumnavigations fall also within this most eventful of eras, and not far beyond it, Mr. Major has proved, the discovery of Australia. "The coasts of Africa visited, the Cape of Good Hope rounded, the New World disclosed, the sea-way to India, the Moluccas, and China laid open, the globe circumnavigated, and Australia discovered within one century of continuous and connected exploration," begun and to a great extent carried out by the prince the story of whose life Mr. Major has told so well. We can only again commend his work and that of Peschel to our readers as not only full of interest but of much valuable information.

OUR BOOK SHELF

Chemical Handicraft. A Classified and Descriptive Catalogue of Chemical Apparatus suitable for the performance of Class Experiments, Research, and Chemical Testing. Second Edition. By J. J. Griffin, F.C.S. (Published by the Author, Garrick Street.)

MR. GRIFFIN, the well-known manufacturer of scientific apparatus, earned the thanks of all students of science in this country by the publication of his first catalogue, now some eleven years ago, when the condition of things was much less far advanced than it is now. He has earned still greater thanks for his last edition, which is much more complete, more copiously illustrated, and more carefully brought up to the present needs of the student and the present possibilities of the maker. Those who noticed the many collections of such apparatus at South Kensington, last year, among which was one sent in by the Messrs. Griffin, cannot have failed to have been struck by the complication of the apparatus now required for chemical researches, and the skill, both in glass and brass, required to produce them. Mr. Griffin is evidently doing his best to uphold English manufactures against his continental rivals, and we wish him and his book every success. As the madman said of the dictionary, it is not light reading, and the plot is feeble; but, nevertheless, the book will be of use in every laboratory.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

The Cretaceous Flora of America

I AM extremely obliged to Dr. Newberry for pointing out in a very kind manner what is the actual state of our knowledge at the present time respecting the American cretaceous beds. Never having travelled in America, nor having had the honour of conversing with any of the American savants who have investigated the remains in these beds, I am scarcely in a position to discuss with them the value of the evidence on which they have been considered cretaceous. I have, however, endeavoured to make myself acquainted with the literature of the subject, and had read most of the works mentioned by Prof. Newberry in his letter to NATURE. I in no way dispute that dicotyledonous leaves have or may be found in cretaceous strata,